The Nordic eBoat Project

Introduction

- Electrification of the transport sector is in full motion.
  - Electric cars have entered the scene even faster than many anticipated.
  - The growth of should cars have been around 50% YoY for the last years.
- The maritime sector is an obvious next target.
  - Ships and boats are able to carry heavy loads in relation to its size, eliminating the best known drawback of the electrification.
  - Many fishing ships and service vessels already use diesel-electric hybrid technology to advance from the flexibility and swiftness of the electric drive.
- The cost of batteries in the EV-sector have reduces by over 2/3 in only 6 years as shown on next page.
  - The cost of batteries for the shipping sector will inevitably follow the same path as batteries for cars but with a time-lag.

Source: InsideEVs.com and author’s guestimate

World EV & Hybrid sales '000

Source: Bloomberg New Energy Finance

Getting Competitive
Battery prices seen reaching key level of $100 per kilowatt hour by 2026

Source: InsideEVs.com and author’s guestimate
To start full electrification of vessels with high utilization.

Through experience and recurrence optimise the technology and design to be ready when constantly lowering battery prices allow implementation in more and more subsectors of shipping.

In the beginning aim at sectors where the current drawback of the battery technology will have the least negative effect.

As vehicles are mainly produces by giant international companies, the opposite is true for the maritime sector.

This fact will give the Nordic coastal countries opportunity to be a leading technology provider in the sector.
In a recent article by the Electric Hybrid Marine Technology magazine:

- It is exciting to see the pace of adoption as battery technology evolves annually and how they are enabling this sector.

- For example, China has launched the first all-electric cargo ship to, ironically, transport coal!

- Economics models build over the lifetime of vessels, which include maintenance, and operation, show that many all-electric options are possible with a RIO of 5 to 10 years.

- Electrification of boats - where a boat is defined as a watercraft with a length of 25m or less is viable right now!
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PROS and Cons....

- A new report by IDTechEx, Electric Boats and Ships 2017-2027, shows that the electric boats market is expected to grow consistently in the next ten years.

- Although this segment of the maritime market looks fragmented, it is still highly profitable and growing:
  - According to the report, the hybrid and pure electric boats and ships market will rise to over US$20 billion worldwide by 2027.

Advantages:
- Environmental friendly
- Avoid engine noise
- Less vibration
- Less engine maintenance
- Fuel economy
- Avoid local contamination
- Less weight of motor
- Less fire hazard

Disadvantages:
- Limited range
- Lower speed (typically)
- High cost

Source: Truls Tveitdal, "Market barriers towards electric boats."
Our team received a grant from Nora (see below) for the first phase of the project to build a full electric boat to be operated in one of the NORA countries.

**Mission:**
- To identify a user in one of the NORA countries that have limited exposure to the disadvantages but makes as much use of the advantages as possible.
- Design a modification or a new boat – full electric.
- The boat has to be in commercial use in order to gain as much operational experience as possible.

**NORA (North Atlantic Cooperation)** is an intergovernmental organisation under the regional cooperation programme of the Nordic Council of Ministers and it brings together Greenland, Iceland, Faroe Islands and Coastal Norway.
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Where to start – pros & cons

**Angling boats for tourists…**

**Pros:**
- Short distances
- Little load
- Adds value to customers
- Many identical boats under same ownership

**Cons:**
- Small market

**Short distance ferries….**

**Pros:**
- Short distances
- Visibility to public
- Add value to customers

**Cons:**
- Small market
- Individual design

**Professional Angling boats….**

**Pros:**
- Very large market

**Cons:**
- Long distances
- Very demanding
Anticipated effect of the project

- At present, boat operators in different sectors do not have many examples to follow if they consider transition from a conventional diesel drive to electricity.

- They fear high installation cost, limited range reduced security.

- Creating an successful example together with easier access to data is likely to change that.
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The team

**Gunnar Tryggvason**, Independent consultant, Iceland
Gunnar holds a master degree in electrical engineering and diploma in finance. He is an experienced engineer, banker and financial advisors. Gunnar is a specialist in the power sector and regulatory issues.

**Karl Sölvi Guðmundsson**, associate professor in Department of Electrical and Computer Engineering at the University of Iceland. Karl holds a Ph.D. in Electrical Engineering. He oversees the electric engineering of Team Spark, the university’s contribution to Formula Students race of electric cars.

**Halfdan Endresen**, CEO of Wave Propulsion AS
Halfdan has developed new unique propulsion system for all type of vessels, including the system installed in the Opal plug in hybrid sail ship.

**Kári Mannbjørn Mortensen**, Head of Energy Department at Umhvorvisstovan,
Kári is He is cand.scient in Biochemistry and Mathematics from the University of Copenhagen and has experience in setting up and developing new projects in the renewable energy section including both utilization and production.

**Jón Björn Skúlason**, CEO of Islensk Nýorka
Jon Bjorn is an economic geographer and has worked in the field of alternative fuels for 20 years. His unique experience is a vital contribution to the project as he was the coordinator of the RENSEA project and also implementation of other alternative transport solutions in Iceland.
Thank you